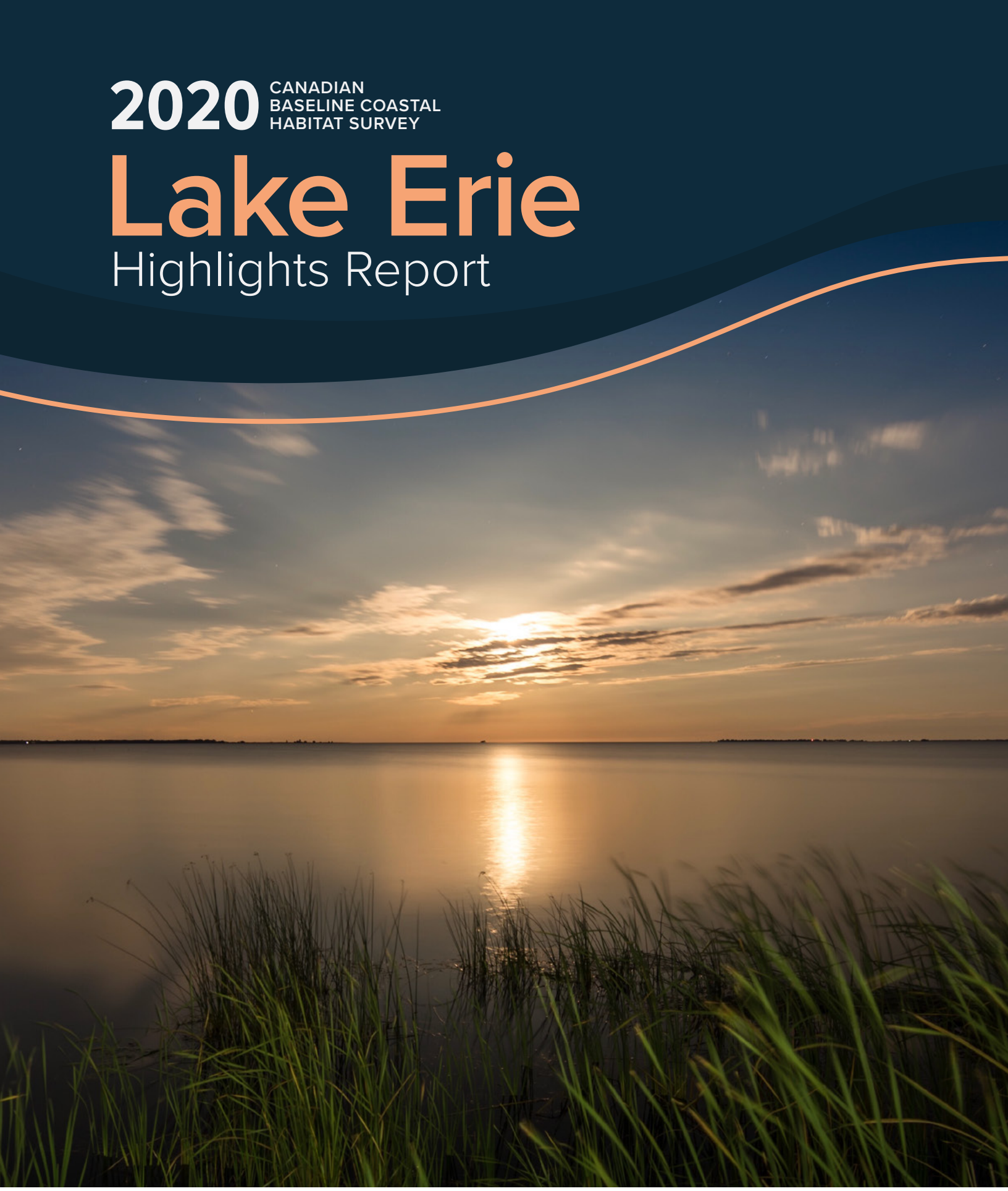
2020 CANADIAN BASELINE COASTAL HABITAT SURVEY

Lake Erie

Highlights Report



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This document supports Canadian commitments in the Habitat and Species Annex of the 2012 Great Lakes Water Quality Agreement and the 2020 Canada-Ontario Agreement on Great Lakes Water Quality and Ecosystem Health. It is intended for resource management agencies, stewardship groups, and others interested in the Canadian Great Lakes coastal ecosystem.

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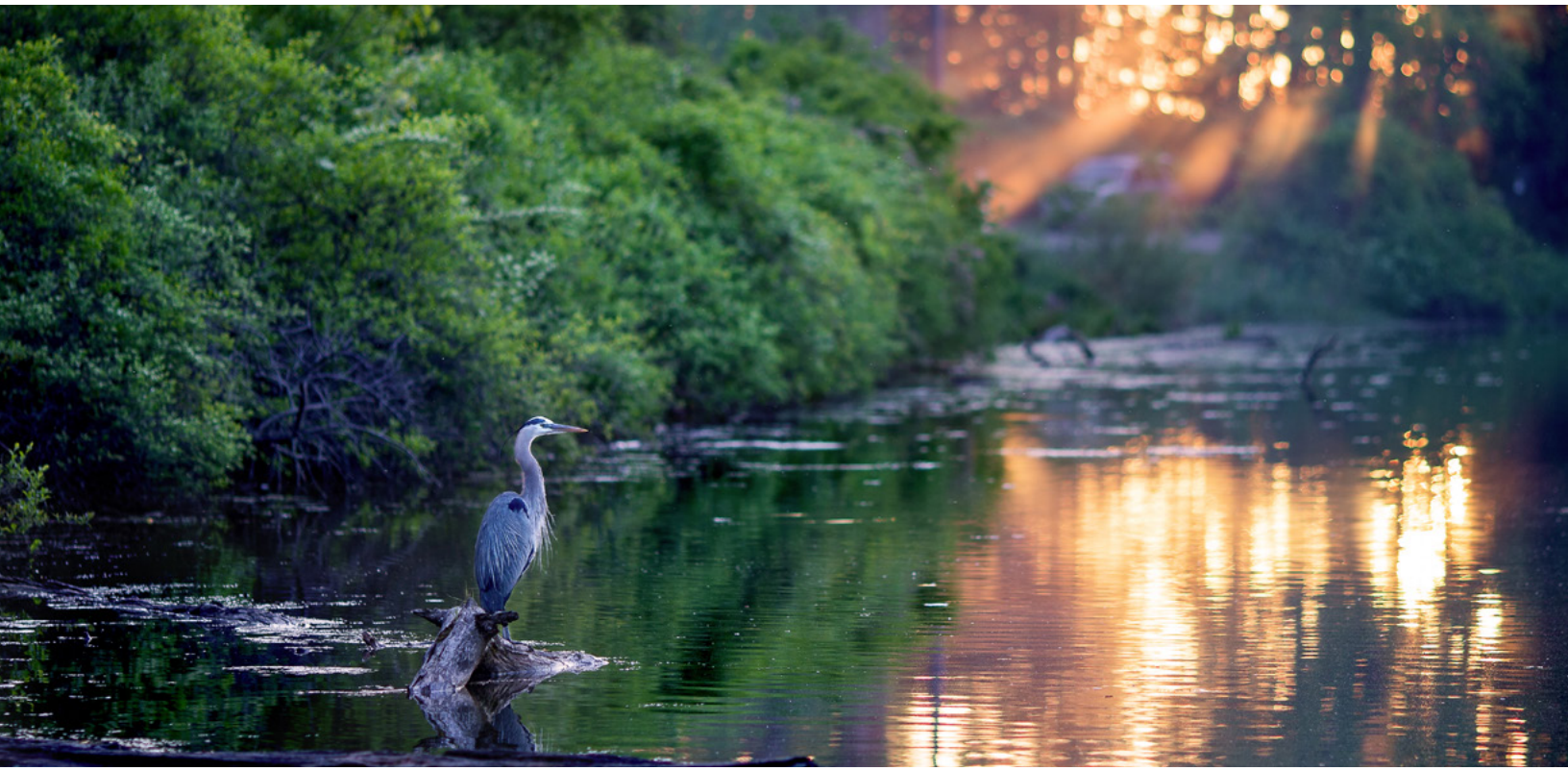


Why a Great Lakes baseline habitat survey?

The Great Lakes ecosystem contains globally significant habitat and a high diversity of native species, some of which are at risk of disappearing from the wild. Threats like invasive species, climate change, pollution, urban development, shoreline development, and dams and barriers, have forever changed the Great Lakes ecosystem. Conserving and restoring the remaining habitat is important to the health of the Great Lakes, and the people, communities, and economies that depend on them.

This survey is the first orderly, easy to understand, and repeatable assessment of existing habitat within the coastal margin of the Canadian Great Lakes. If the survey is repeated, then, over time, Canadians will be able to identify gains in net habitat as a measure of conservation success.

Net habitat gain is defined as one or more of the following:

- increasing the area of habitat
- increasing biodiversity
- improving ecological condition
- enhancing ecological function
- increasing the area of protected lands
- restoring habitat

This report summarizes the results of the first coastal habitat survey for Lake Erie. The *2020 Canadian Baseline Coastal Habitat Survey: Lake Erie Technical report* contains detailed results.

The results of this survey will allow Canadians to:

- understand the current extent of natural habitats and human land use;
- identify areas / actions for restoration or protection of natural habitats; and
- compare present and future habitat inventories to identify gains or losses.

Survey Area

The survey captures the Lake Erie coastal ecosystem from Sarnia to the Niagara River, beginning at the high water mark to two kilometres inland (Figure 1). The coastal margin links the watershed with the nearshore waters, and the size, diversity, condition, and function of coastal habitats influence the ecological health of Lake Erie.

For the purposes of this survey, sixteen physiographically and ecologically unique coastal units were defined to facilitate analysis and reporting.

Figure 1. The coastal units for Lake Erie and the Huron-Erie corridor.

Coastal Units

1. St. Clair River CDN
2. Walpole Island/Delta
3. Lake St. Clair CDN
4. Detroit River CDN
5. Western Basin
6. Point Pelee
7. Point Pelee to Rondeau
8. Rondeau
9. Rondeau to Port Glasgow
10. Port Glasgow to Port Stanley
11. Port Stanley to Port Burwell
12. Port Burwell to Long Point
13. Long Point
14. Long Point to Port Dover
15. Port Dover to Grand River
16. Grand River to Niagara River

Habitat categories and measures

The Lake Erie Survey began in 2019 when Environment and Climate Change Canada, the Ontario Ministry of Northern Development, Mines, Natural Resources and Forestry and the Department of Fisheries and Oceans developed a multi-agency technical task team. This team coordinated data assembly, information sharing, geo-spatial data analysis, and reporting.

The survey focuses on four habitat categories that are at the core of coastal conservation efforts because of their importance to biodiversity and the health of the Great Lakes. Measures were selected by provincial and federal governments to provide key information to establish a baseline, or benchmark, of habitat quantity, quality, condition, function, protection, and restoration (Table 1).

* Ecologists further subdivide habitat into finer scaled units (herein defined as ecosites) based on vegetation communities determined by local climate, landforms, topography, soils and moisture.

Table 1. Key habitat categories and measures

Wetlands	Uplands	Tributaries/ Inland Lakes and Ponds	Coastal Landscape
• Total wetland area	• Total natural upland area	• Number of fish species	• Number of species of conservation concern
• Total coastal wetland area	• Diversity of natural upland ecosites*	• Area of vegetation in riparian buffers	• Number of structures perpendicular to the shore
• Area of coastal wetlands by hydrogeomorphic type	• Total area of human land use	• Number of barriers in tributaries	• Amount of hardened shoreline
• Area of coastal wetlands by hydrogeomorphic type	• Total area of hardened surfaces	• Area of inland lakes and ponds	• Area of protected land
• Total historical wetland area			• Habitat connectivity
• Diversity of wetland ecosites*			• Area of restored habitat
• Abundance of *Phragmites australis*			

Results for wetlands

Coastal wetlands are directly influenced by the Great Lakes and are found along shorelines and at the mouths of tributaries.

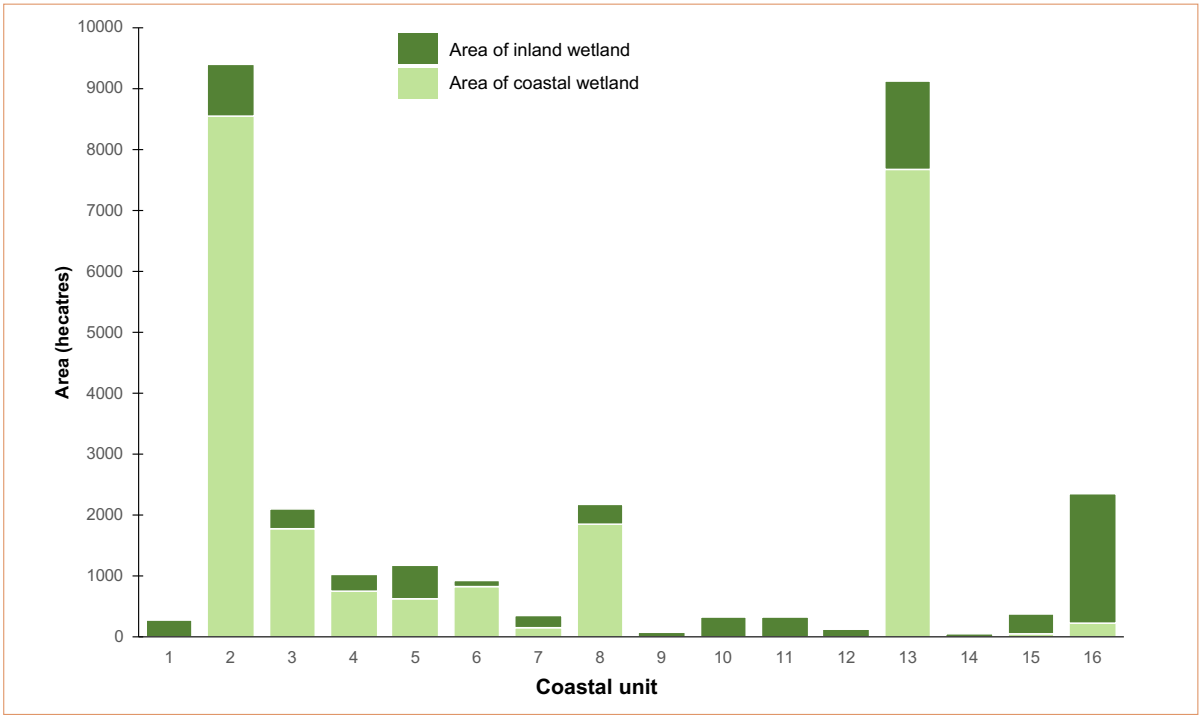
Inland wetlands are found along floodplains, streams, lakes, and ponds, and in isolated depressions and other low-lying areas.

Wetlands are essential for supporting Great Lakes biodiversity. They support critical life stages of aquatic species, including two-thirds of all Great Lakes fishes. Wetlands provide at least $14 billion annually in economic benefits to Ontarians by improving water quality, protecting shorelines and property against storms, reducing erosion and flooding, and providing many recreational values.

Area of wetland

- Wetlands cover 20% of the survey area (29,994 ha).
  - **Coastal wetlands** cover 75% of this area.
  - **Inland wetlands** (marshes, swamps, and shrub swamps) cover 25% of this area.
  - By hydrogeomorphic type: 43% are lacustrine, 46% are riverine, and 11% are barrier protected.
  - The Walpole Island and Long Point units have the largest areas of coastal wetlands (Figure 2).
- The Grand River to Niagara River unit has the largest area of inland wetlands (Figure 2).

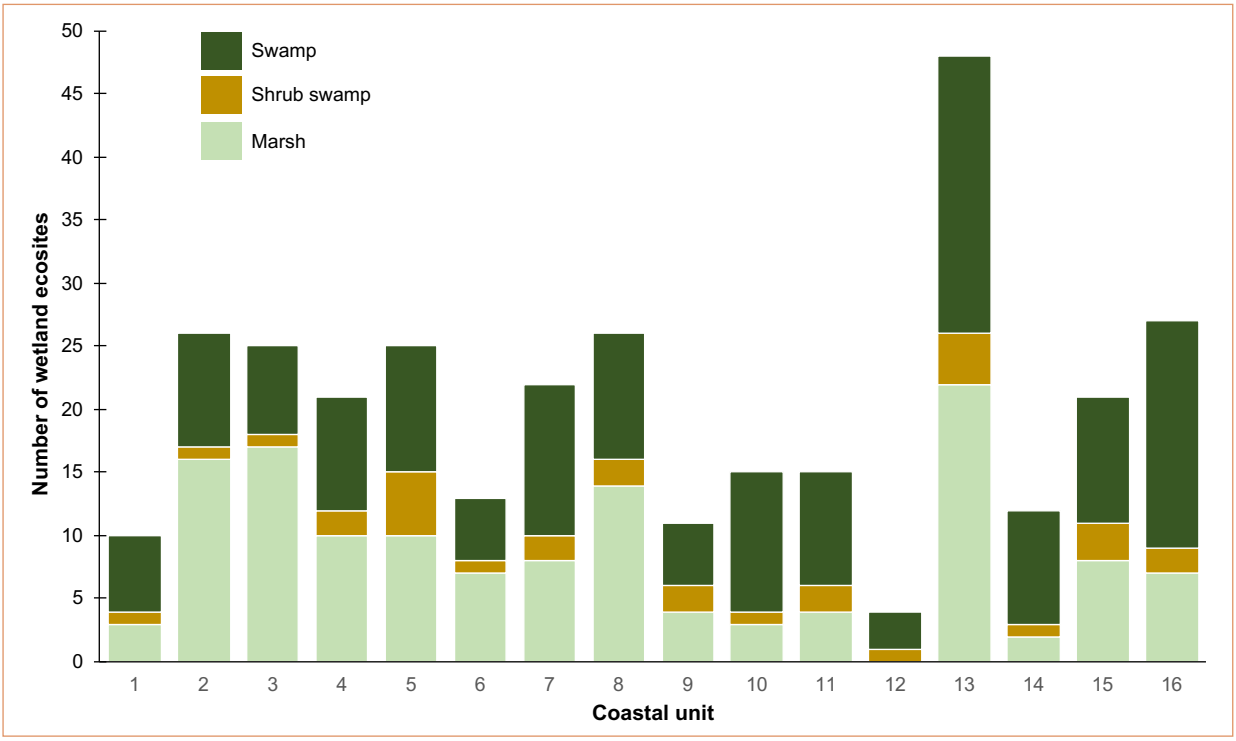
Figure 2. Area of wetlands in each coastal unit.



Diversity of wetland ecosites

- The survey area contains three wetland classes (marsh, shrub swamp, swamp); comprising of 63 unique wetland ecosites.
- Bogs and fens were not observed within the survey area.
- The Long Point unit has the richest diversity of wetland ecosites at 48 (Figure 3).
- The Port Burwell to Long Point unit has the lowest diversity of wetland ecosites, with four (Figure 3).
- Three coastal units contain distinctive, globally rare calcareous Great Lakes coastal meadow marshes.

Figure 3. Number of wetland ecosites in each coastal unit.



Amount of Phragmites australis

The invasive European Common reed (*Phragmites australis* ssp. *australis*) dominates some wetland plant communities and negatively impacts their health.

- Common reed occupies over 23% of the wetland habitat in the survey area,
- The Walpole Island and Long Point units have the largest areas of *Phragmites.*
- Emergent and meadow marshes are most threatened by invasive *Phragmites* as they can out-compete native plants and decrease biodiversity.

Key findings about wetlands

- Wetlands in the survey area support 198 species of conservation concern including Lake Erie Watersnake, Spiny Softshell, Fowler's Toad, King Rail and Prothonotary Warbler.
- Barrier-protected coastal wetlands dependent upon natural sediment supplies are greatly impacted by 21 shore-perpendicular structures that disrupt the longshore transport of sand and gravel.
- 30% of the land in the Point Pelee, Rondeau, and Long Point units is protected; these coastal units have large contiguous wetlands (Figures 4 and 5) and many different wetland ecosites.
- A majority of wetlands across the survey are less than five hectares in size (Figure 6)
- *These smaller wetlands are typically less resilient to disturbances but support sensitive and or rare plant communities.*

Figure 4. Ten largest contiguous wetlands in the survey area.

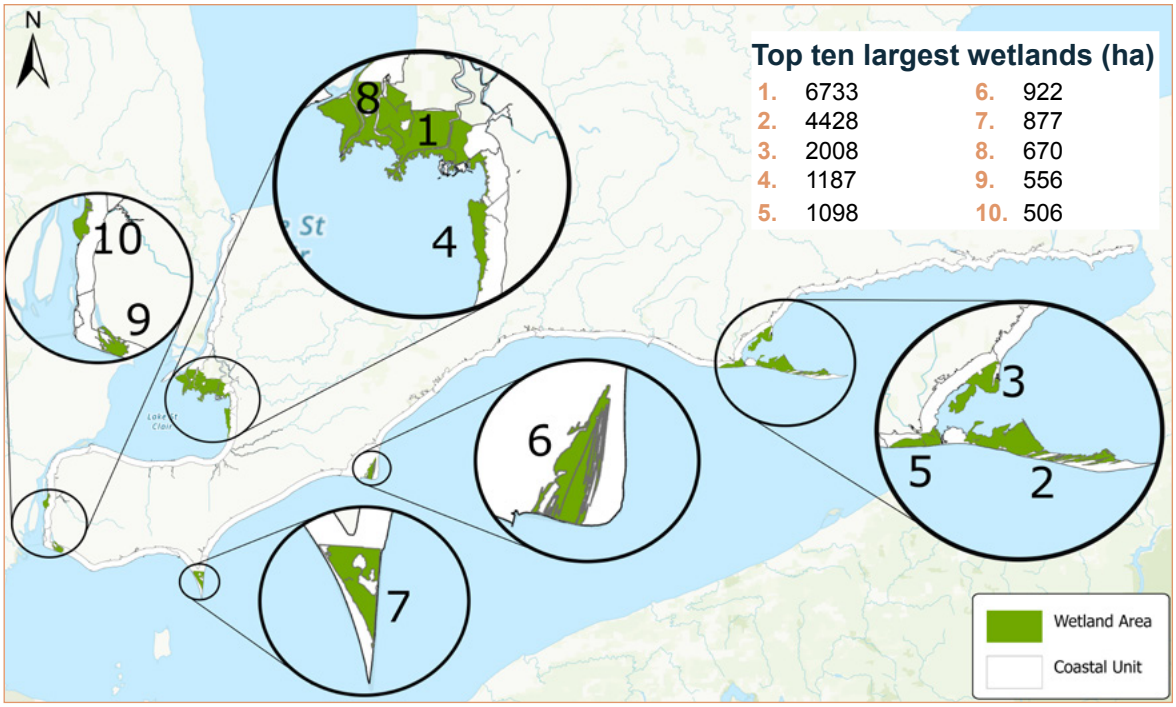


Figure 5. Distribution of wetlands in the survey area.

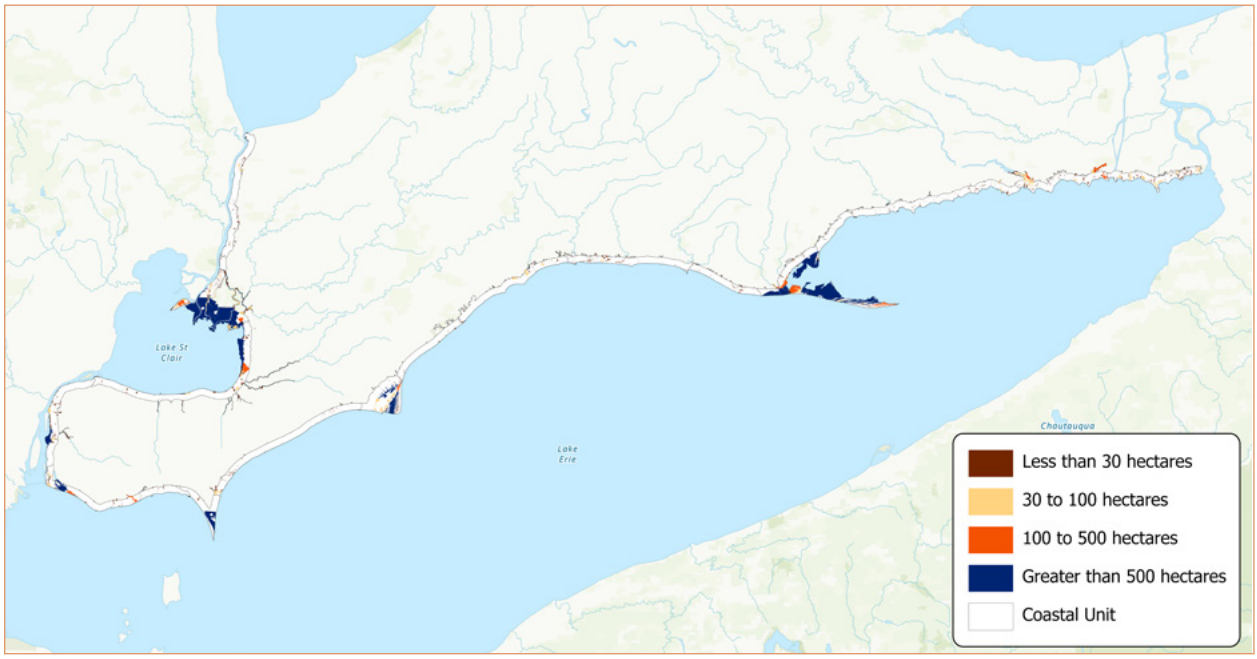
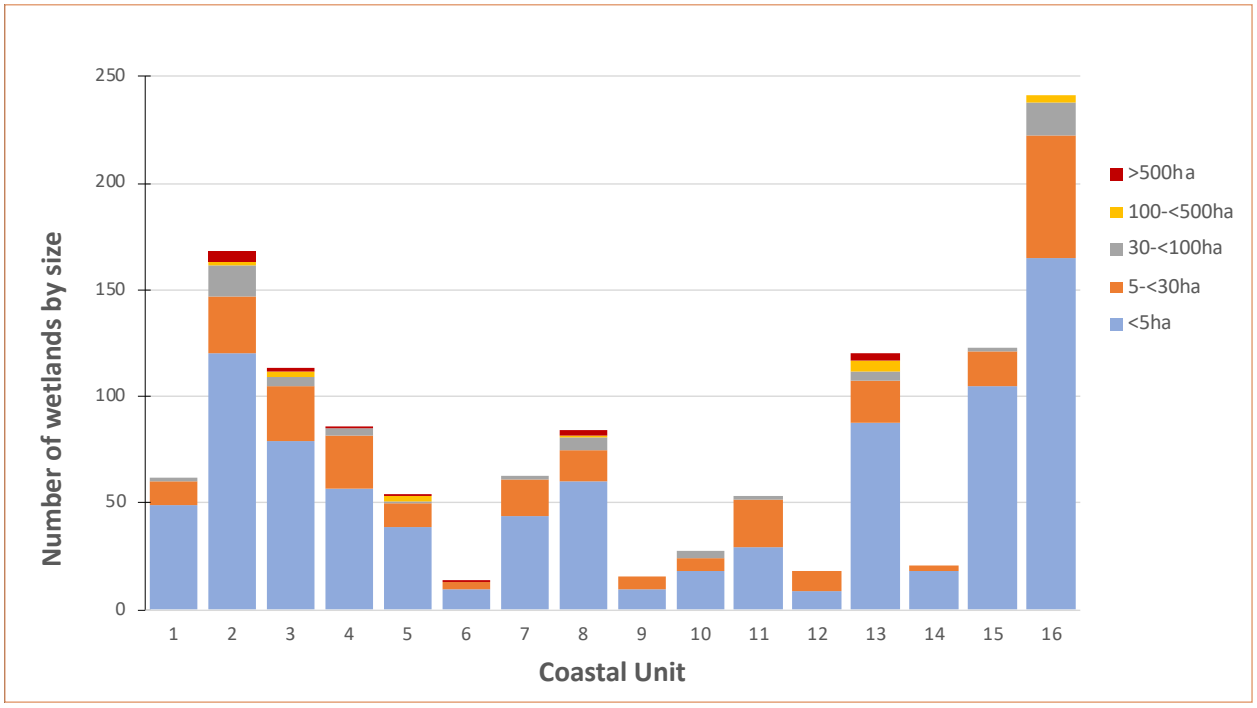


Figure 6. Distribution of wetlands in the survey area by size.



Results for uplands

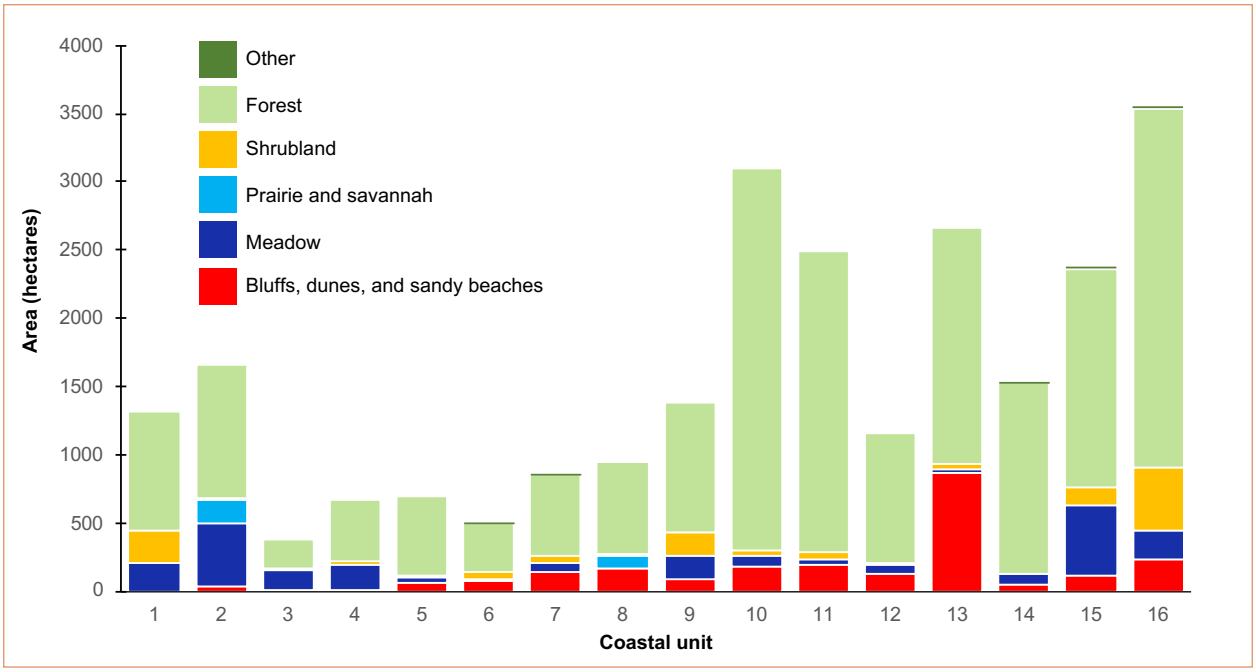
Uplands in the survey area contain both ecologically significant natural habitats and human land-use areas. Lake Erie is rich in uncommon and rare **natural upland habitats** found nowhere else in Canada, including rich Carolinian forests, alvars, sand dunes, bluffs, prairies and savannahs.

Natural uplands are essential for migratory and resident birds, mammals such as the Little Brown Bat and American Badger, and insects like the Tulip Tree Silk Moth and the Little White Tiger Beetle. These habitats also support many plant species that are globally rare and only exist in the Great Lakes ecosystem. There is a complex link between natural upland habitat and the biodiversity and health of the Great Lakes. Much of the Great Lakes natural upland habitats have been lost to land clearing and timber harvesting, and converted for agriculture, and urban and rural developments. These activities have significantly affected the ecosystem's health, causing changes to habitat integrity, natural physical processes, and species assemblages.

Area of natural upland habitat

- Natural upland habitats account for about 17% of the survey area (25,246 ha); the majority of which are forests, representing 75% of all natural upland habitat.
- Meadows, shrublands, dunes, shorelines, bluffs, prairies, barrens, and rock lands make up the remaining area.
- The Long Point to Port Dover unit has the largest proportion of natural upland habitat at 47% (Figure 7).
- The Lake St. Clair unit has the smallest proportion of natural upland habitat at 2.5%.

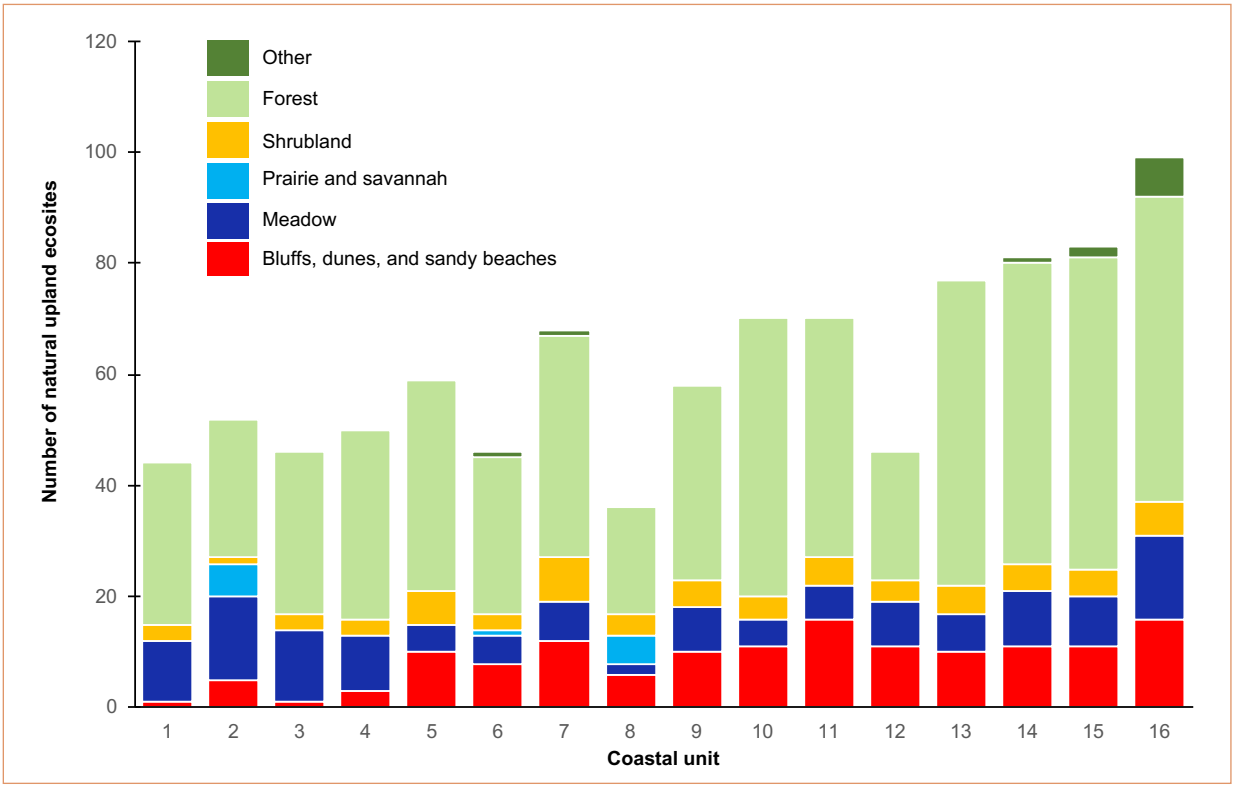
Figure 7. Area of natural upland habitat in each coastal unit.



Diversity of natural upland ecosites

- The survey area supports 214 different natural upland ecosites including unique prairie and savannah habitats within Walpole, Point Pelee, and Rondeau units.
- The Grand River to Niagara River unit has the highest number of different natural upland habitat types (99, Figure 8).
- The Rondeau unit has the lowest number of different natural upland habitat types (36, Figure 8)
- 14/16 coastal units still contain Carolinian tree species (e.g. American Chestnut and Kentucky Coffee-tree).

Figure 8. Number of natural upland ecosites in each coastal unit.



Area of land used for human activities and area of hardened surfaces

- Human land use accounts for 60% of the survey area.
  - 40% of the survey area is agricultural land; 18% is hardened surfaces like roads, houses, and commercial buildings; and 2% is stormwater management ponds.
- More than 50% of the land in 13 coastal units is comprised of humand land uses; in five of these, human land use occupies more than 75% of the land.

Key findings about natural upland habitats

- Despite representing 75% of all natural upland habitat, forests have been fragmented across the survey area, with extensive losses in the southwestern watersheds
- The survey area has 17 protected areas, including Clear Creek Forest Provincial Park and John E. Pearce Provincial Park.
- Ontario Parks created both parks to conserve biodiversity and strictly controls human activity in them.
  - While Rondeau has the lowest amount of upland habitat, it has one of the largest contiguous forests because of its protection status.
- The remaining larger contiguous forest plots are found in the central and eastern watersheds (Figure 9).
- Despite their fragmented nature, there is an abundance of smaller forested areas (less than 50ha) throughout the coastal margin that provide opportunities for improved habitat connectivity (Figure 10).

Figure 9. Ten largest contiguous forests in the survey area.

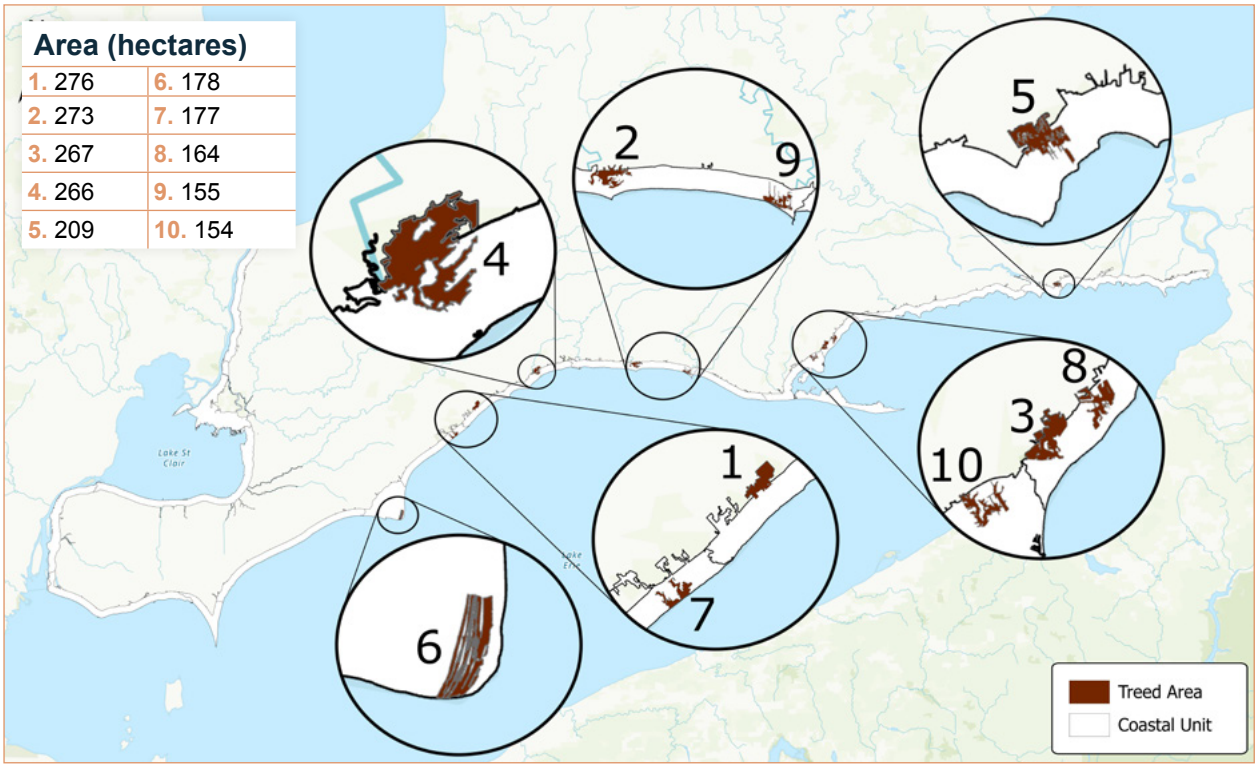
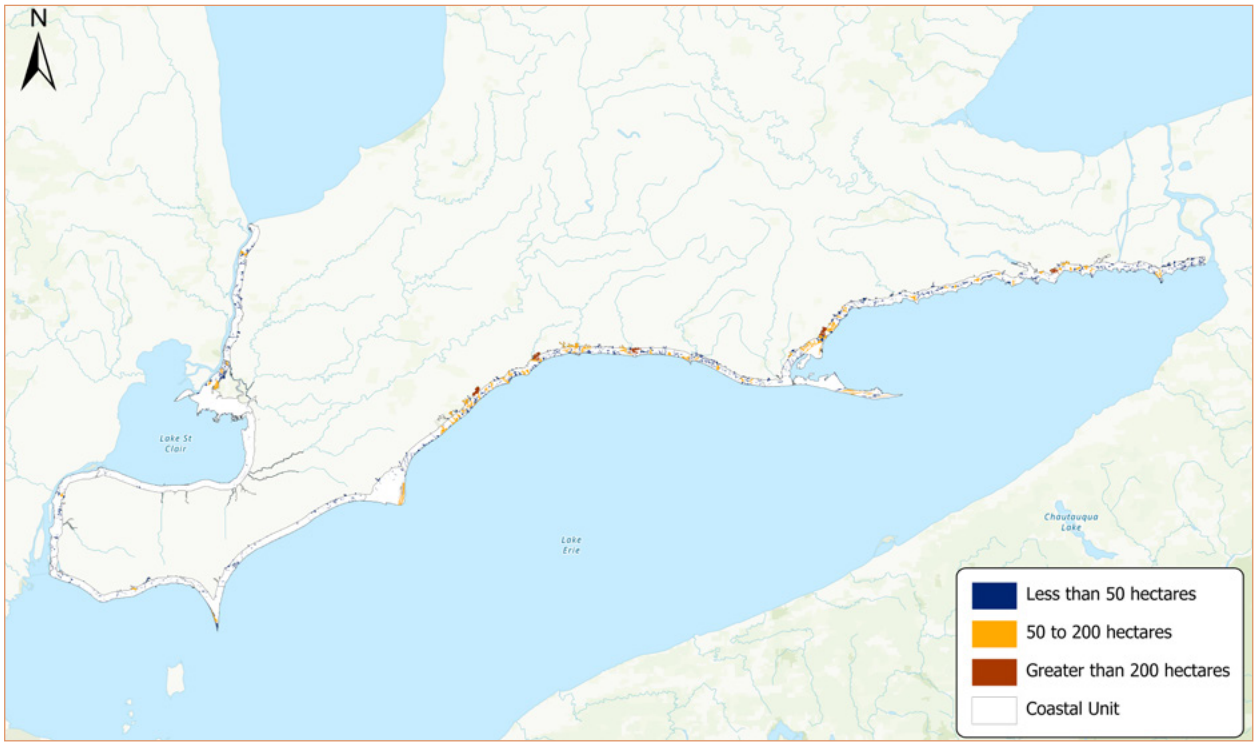


Figure 10. Distribution of forests in the survey area.



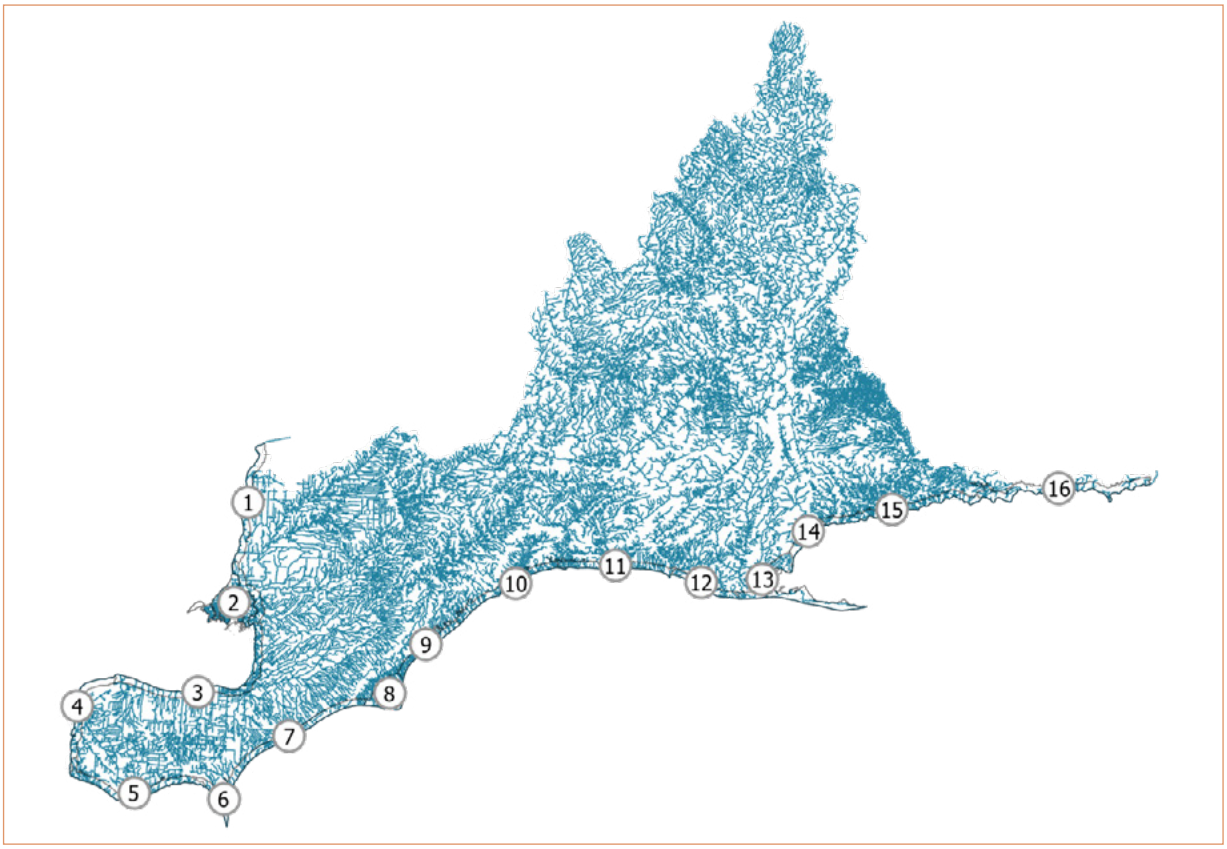
Results for tributaries / inland lakes and ponds

Permanent waterways, waterways that only flow at certain times of the year, and constructed open tile drains are examples of tributaries.

Tributaries transport nutrients, organic matter, sand and sediment downstream to the nearshore ecosystem. They also provide spawning, nursery, overwintering and feeding areas for many native species. Farming, flood control, industrial water-taking, and development have greatly changed tributary health and function.

Understanding how tributaries drain through each coastal unit gives context to the measures used to assess tributary habitat. Each coastal unit has a different number and length of tributaries. For example, the Walpole Island unit has 470 kilometres of tributaries within the 2-km coastal margin, and almost 4,700 kilometres of tributaries draining into the unit from the surrounding watershed. In comparison, the Point Pelee coastal unit has 39 kilometres of tributaries and 29 kilometres draining into the unit upstream. It is important to consider the watersheds contributing to each of the sixteen coastal units, especially when comparing them based on the measures discussed here. Figure 10 shows the tributaries upstream of each coastal unit that contribute to the condition and health of the habitat within the coastal areas.

Figure 11. Tributaries connected to coastal units.



Inland lakes and ponds are permanent bodies of water created by drainage and precipitation. The area of inland lakes and ponds varies across the survey area.

- Inland lakes and ponds make up 3% of the total survey area.
- The Rondeau unit has the largest area of inland lakes and ponds, with 22% of the coastal unit
- This represents 47% of the area of inland lakes and ponds in the entire survey area.

Number of fish species

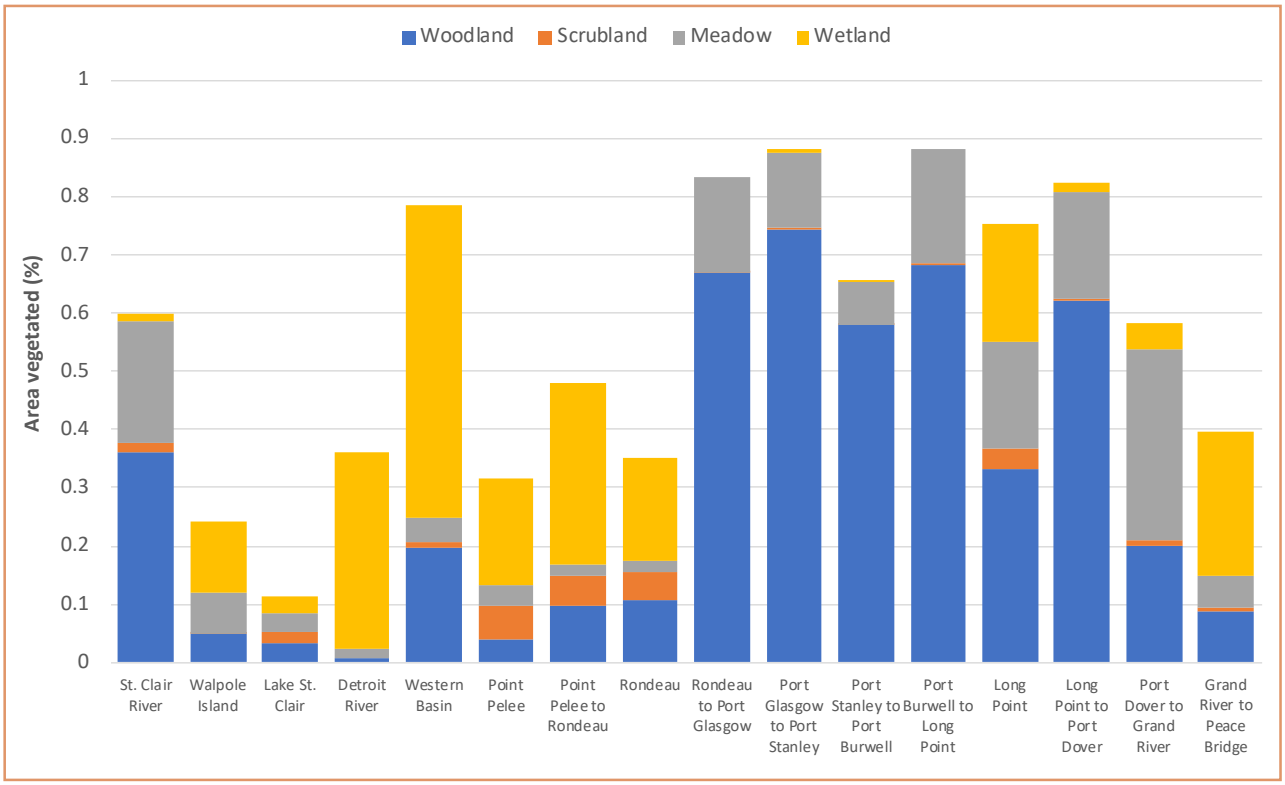
- Fish diversity was represented using species richness, or the number of fish species found in each coastal unit.
- Fish species richness was assessed for eight coastal units based on available data.
- Field survey efforts and data varied for each of these coastal units.
- Tributaries in the Port Dover to Grand River unit have the most fish species (66).
- Tributaries in the Port Burwell to Long Point unit have the fewest fish species.
- For this summary, the results reflect the number of inventories completed in each coastal unit. Further work is recommended to provide a consistent amount of fish sampling across coastal units and confirm our estimates of fish species richness.

Area of vegetation in riparian buffers

The amount of vegetation in the 30 meter area next to tributaries (called riparian buffer) was used as a measure of tributary condition. Riparian buffers reduce the amount of sediment and pollutants from entering tributaries, control erosion, provide important habitat for native species and support tributary health.

- On average across all the coastal units, 52% of the 30-metre buffer is vegetated (Figure 12).
- Woodland is the most common vegetation type, followed by meadow, wetland, and scrubland.
- The Port Glasgow to Port Stanley and Port Burwell to Long Point units have the largest vegetated areas in their 30-metre buffers.
- The Lake St. Clair unit has the smallest vegetated area in its 30-metre buffer. The banks of tributaries in this unit have less vegetation than tributaries in other units.

Figure 12. Percentage of buffer covered by vegetation and composition of that vegetation of the four main types.



Number of tributary barriers

The connections between a tributary and its floodplain, and within the upstream and downstream reaches, influence how sediment, nutrients, carbon, and native species move throughout a watercourse.

Tributary barriers remain a threat across the Lake Erie coastal margin (Table 2). Migratory fishes, for example, swim short or long distances from daily to annually, as a way to complete their life cycle, feed and/or reproduce.

- Tributaries in the Lake St. Clair unit have the most barriers (39).
- Tributaries in the Detroit River unit have no barriers.
- Tributaries in seven coastal units have three or fewer barriers.

* Four coastal units have one sea lamprey barrier each and are all located in the Eastern portion of the Lake Erie Drainage (Port Burwell to Long Point, Long Point, Long Point to Port Dover and Port Dover to Grand River). These barriers cannot be removed because they block adult sea lampreys that harm native fish populations and allow jumping fish to pass safely.

Table 2: Number of barriers by coastal unit

Coastal Unit	Barriers
1. St. Clair River	4
2. Walpole Island	19
3. Lake St. Clair	39
4. Detroit River	0
5. Western Basin	4
6. Point Pelee	2
7. Point Pelee to Rondeau	2
8. Rondeau	4
9. Rondeau to Port Glasgow	3
10. Port Glasgow to Port Stanley	6
11. Port Stanley to Port Burwell	25
12. Port Burwell to Long Point	9*
13. Long Point	1*
14. Long Point to Port Dover	13*
15. Port Dover to Grand River	3*
16. Grand River to Niagara River	2

Results for the coastal landscape

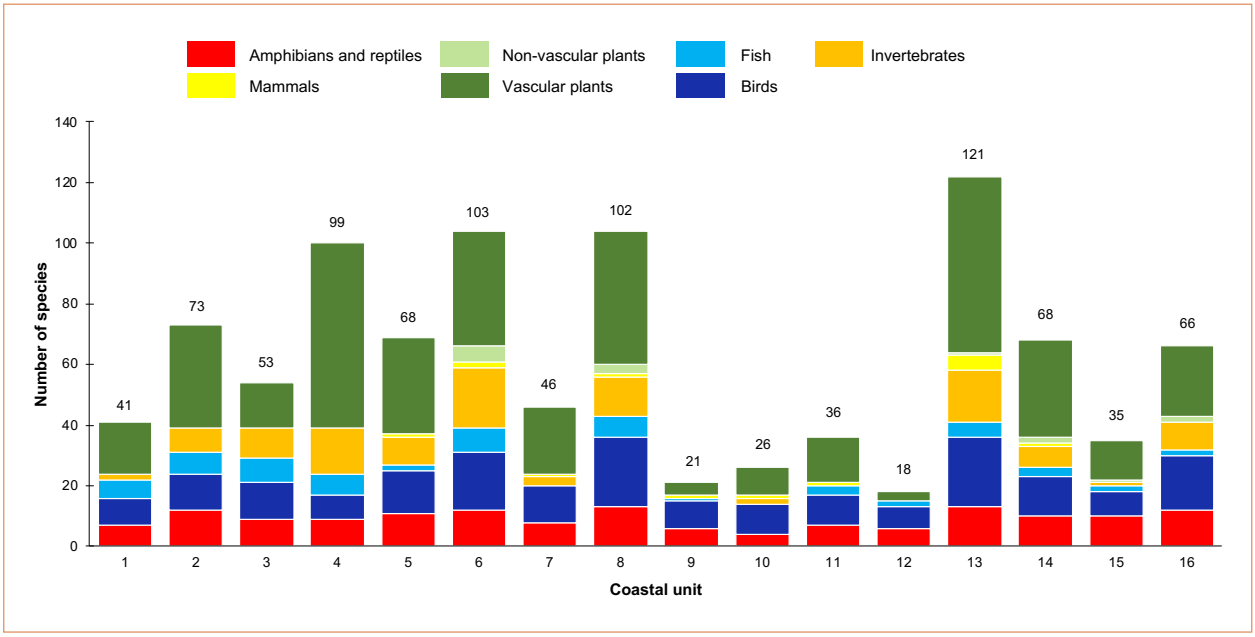
The Great Lakes ecosystem is one of the most biodiverse regions in North America. Since Europeans first settled in the lower Great Lakes basin, the human population has continued to grow, leading to expansion of cities and towns across the landscape. These land use changes have resulted in the Great Lakes ecosystem losing large amounts of natural habitats. The following measures were used to assess broad ecological changes to the survey area for all habitats.

Number of species of conservation concern

Species of conservation concern include species at risk and other rare species. The American Badger, Kentucky Coffee-tree, Monarch, Peregrine Falcon, and Spoon-leaved Moss are examples of species of conservation concern in the survey area (Figure 13).

- Plants are the most abundant group, followed by invertebrates and birds.
- The Long Point, Point Pelee, and Rondeau units have the most species of conservation concern. This reflects their diverse habitats (wetlands, sand dunes, and Carolinian forests).
- The Detroit River unit also supports numerous species of conservation concern. Many occur in the tallgrass prairies and savannahs near Windsor.

Figure 13. Number of Species of conservation concern by coastal unit.



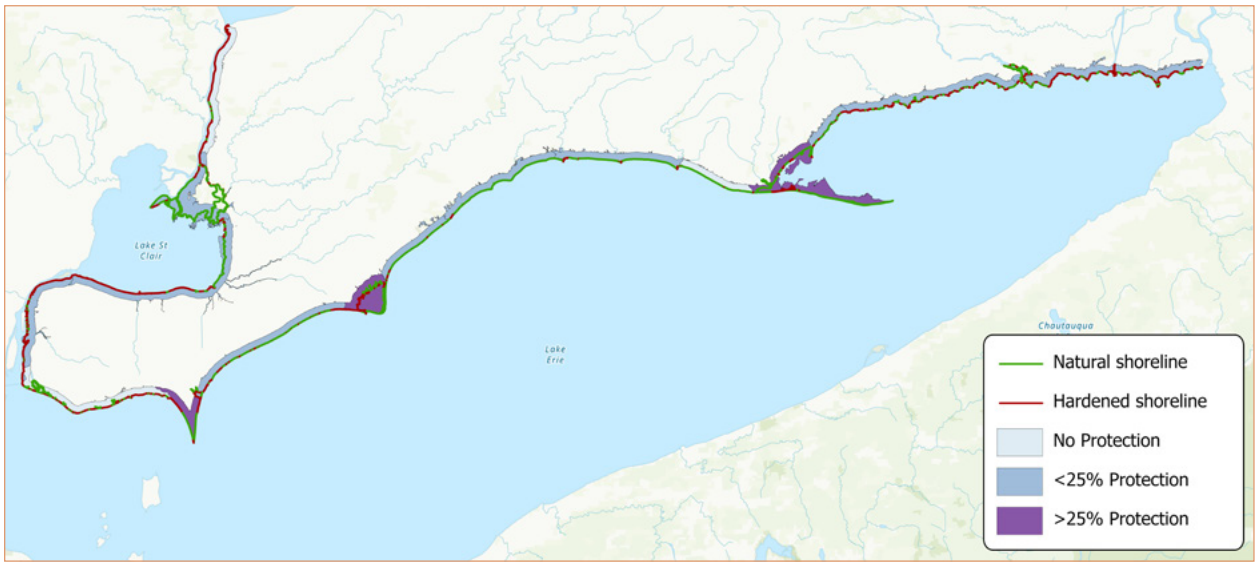
Amount of hardened shoreline

Shoreline hardening is the process of adding artificial structures like seawalls, jetties, offshore breakwaters to natural shorelines. Hardened shorelines reduce ecosystem services, alter natural coastal processes, and degrade shoreline habitats important to native species. Figure 14 shows natural and hardened shorelines across the survey area.

- 39% of the shoreline in the survey area is hardened.
- The St. Clair River (90%) and Detroit River (84%) units have the highest proportions of hardened shorelines.

The Rondeau to Port Glasgow, Port Glasgow to Port Stanley, Port Stanley to Port Burwell, and Port Burwell to Long Point units have the highest proportions of natural shorelines.

Figure 14. Amount of protected land and amount of hardened shoreline across the survey area.



Number of shore-perpendicular structures

Long breakwater piers and jetties can trap sand and gravel, causing erosion on adjacent shorelines and starve beaches and wetlands from sand nourishment.

The survey area contains 21 of these shore-perpendicular structures of greater than 100m in length.

Area of protected land

The survey included publicly owned protected areas that meet the International Union for the Conservation of Nature's criteria for protected areas. It did not include privately owned protected areas or land managed by conservation authorities.

- Protected areas cover 6.93% of the survey area.
- The Long Point, Rondeau, and Point Pelee units contain 85% of the protected land in the survey area.
- The Detroit River unit supports many species of conservation concern yet only has 0.4% of the coastal unit protected.

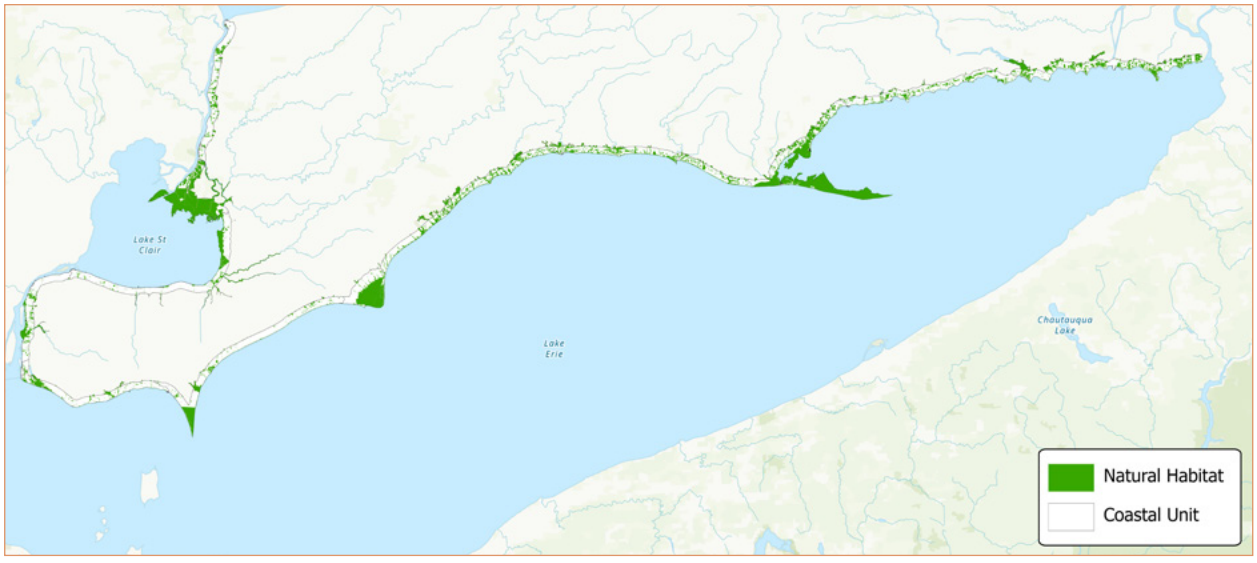
Habitat connectivity

Habitats connected to other habitats help species to migrate, feed, reproduce, and respond to land use stressors and climate change. They also allow natural communities to maintain their ecosystem functions.

The Walpole Island, Lake St. Clair, Point Pelee, and Long Point units each have well connected habitats. The Walpole Island, Lake St. Clair, and Point Pelee units are threatened because habitats in their surrounding watersheds are poorly connected (Figure 15).

- The Point Pelee to Rondeau, Rondeau to Port Glasgow, Long Point to Port Dover, and Port Dover to Grand River units each have poorly connected habitats. Habitat in their surrounding watersheds is also poorly connected.

Figure 15. Distribution of natural habitat within the survey area.



Area of restored habitat

Under various programs (e.g. the Eastern Habitat Joint Venture, 50 Million Trees program) and to meet a variety of fish and wildlife ecosystem objectives under the Canada-Ontario Agreement on Great Lakes Water Quality and Ecosystem Health (COA), the Ontario Ministry of Northern Development, Mines, Natural Resources and Forestry provides support to on-the-ground habitat restoration projects. Between 2015 and 2020, over 1,800 hectares of habitat in the survey area was restored and/or enhanced through vegetative plantings, invasive species management or removal, wetland creation, installation of nesting habitats and/or re-designing tributaries to enhance biodiversity. This was achieved through the collaborative efforts of many Great Lakes partners – governments, community groups, conser-vation authorities, private landowners, non-government agencies and countless individuals acting as stewards of the Great Lakes ecosystem.

Conclusion

The results of the Lake Erie Survey give Canadians reasons to be both optimistic and concerned about the quantity, quality, condition, and function of existing wetland, upland, tributary habitat and the coastal landscape as a whole. Development impacts, including habitat loss and pollution, combined with climate change challenges are greatly affecting the health of the Lake Erie coastal ecosystem and the ecological services flowing from them. However, encouraging a greater degree of habitat protection and increasing stewardship and restoration will enhance the resilience of the remaining habitats.

Additional results and spatial data are found in an accompanying technical report. Resource management agencies, environmental non-governmental organizations, and local stewardship groups can use these survey results to establish local targets of net habitat gain and evaluate conservation success over time. The survey authors encourage stewardship groups to integrate additional information at an appropriate scale.

Great Lakes science is quickly advancing with new tools and techniques. Future iterations will build on and update the current survey to determine habitat change (loss or gain) over time. With multiple agencies working collaboratively, coordinating and storing the most up-to-date data will improve the ability to assess the extent and condition of Lake Erie's coastal habitats.